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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,079	03/28/2001	Grant Kloster	42390P11026	4031

8791 7590 07/31/2002

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EXAMINER

MAGEE, THOMAS J

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 07/31/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/820,079

Applicant(s)

KLOSTER ET AL.

Examiner

Thomas J. Magee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Claims 1 – 20 in Letter No. 10 of June 26, 2002 is acknowledged.

Claim Rejections – 35 U.S.C. 112

2. The following is a quotation of the second paragraph of U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 15 recites an effective dielectric constant of the same ILD layer that is essentially already recited in Claim 14.

Claim Rejections – 35 U.S.C. 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 2, and 5 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 6,291,887 B1) in view of Ahn (US 2002/0090806 A1).

6. Regarding Claim 1, Wang et al. disclose (Col. 12, lines 20 – 32) a structure formed on a substrate with a first low k dielectric layer (diffusion barrier layer) and a nitride layer (etch stop layer) deposited on top, covered by another dielectric layer (ILD layer).

Although Wang et al. do not disclose the effective dielectric constant of the stacked structure, the structure inherently possesses an effective dielectric constant less than about three since a nitride layer is incorporated with two low k layers, each having dielectric constants less than three.

7. Regarding Claim 2, Wang et al. do not explicitly disclose a specific thickness for the diffusion barrier, but the recited thickness in the range, “one monolayer to 2500 Angstroms” is consistent with Wang. However, Ahn et al. disclose (page 5, 1st col., lines 34 – 36) a similar structure with a thickness of about 2,000 to 15,000 Angstroms. It would have been obvious to one having ordinary skill in the art at the time of the invention to form to utilize a layer having the claimed thickness, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. In re Dailey, 93 USPQ 47 (CCPA 1966), the court held that changes in size and shape of parts of an invention, in the absence of an unexpected result, involves only routine skill in the art.

8. Regarding Claims 3 and 4, Wang et al. disclose (Col. 8, lines 16 – 21; lines 44 – 46) that the first (diffusion barrier) layer is a polymer (organic) and the etch stop layer is

nitride (inorganic).

9. Regarding Claims 5 and 6, Wang et al. do not disclose an inorganic/organic stacking sequence from the substrate. In contrast, Ahn disclose (page 5, 1st col., lines 32 – 33; 37 - 42) that the first dielectric layer is inorganic (oxide) and the second (etch-stop) layer is organic (polymer) in composition. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include Ahn in Wang et al. to obtain an inorganic/organic layer stacking sequence to effectively block diffusion from the substrate.

10. Regarding Claims 7 and 8, Wang et al. do not disclose the presence of a contact trace disposed within the substrate. However, Ahn discloses (page 5, 1st col., lines 12 – 25) the presence of a contact region (trace)(52) and a contact (80) extending through the dielectric layers (55,56,57) and making an electrical connection with the trace (See Figures 12 and 13). Although Ahn does not disclose a “single” damascene structure for the contact, a dual (or T-shaped) damascene structure is formed. The difference between a single and a dual damascene involves only a change in shape and a continuous etch through the layers for the single, whereas the dual requires two etch steps. Hence, it would have been obvious to one of ordinary skill in the art at the time of the invention to alter the “shape” of the contact to produce a single damascene structure. Consistent with rulings of the court, changes in the size and shape of parts of

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an invention, in the absence of an unexpected result, involves only routine skill in the art.

11. Claims 9 –20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn in view of Wang et al.

12. Regarding Claims 9 and 10, Ahn discloses (page 5, lines 12 – 25; 34 – 36) a structure containing a planar metal conducting trace within the substrate, a first (diffusion layer) insulating layer, and a second insulating layer (etch stop). Further Ahn discloses that the composition of the barrier layer and etch stop layer can be independently selected from organic or inorganic sources. Ahn does not disclose the presence of an overlying ILD layer, but Wang et al. disclose a similar structure with an ILD layer deposited on top of the second layer. Hence, it would have been obvious to include Wang et al. in Ahn to produce the overlying ILD layer.

13. Regarding Claim 11, Ahn discloses that the thickness of the diffusion barrier layer is between 2,000 and 15,000 Angstroms, which is well within the thickness recited (2,500 Angstroms) in the instant application.

14. Regarding Claims 12 – 15, neither Wang et al. or Ahn disclose the effective dielectric constants for the stacked diffusion barrier/etch stop/ILD layer sequence. However, as discussed earlier, it would be inherently obvious that an effective dielectric constant in the range, 2.6 to 2.8, could be obtained since the layer sequence includes a nitride

layer and two low k layers with dielectric constants less than three.

15. Regarding Claims 16 – 18, Ahn discloses a structure containing a first dielectric layer (silicon oxide)(inorganic), a second dielectric layer (parylene, polyimides, polymers) (organic) and a damascene article in contact with the substrate and dielectric layers. Ahn does not disclose an overlying ILD layer. However, Wang et al. do disclose an ILD layer. It would have been obvious at the time of the invention to one of ordinary skill in the art to add Wang et al. to Ahn to obtain an ILD layer atop the two layer sequence and containing the damascene structure.

16. Regarding Claims 19 and 20, Ahn does not disclose the values of dielectric constant for the second dielectric layer. However, these are routinely available in handbooks and it would be trivial and obvious for one of ordinary skill in the art to select materials from the range of organic materials disclosed by Ahn, exhibiting dielectric constants in the approximate range, 2.0 to 2.8.

Conclusions

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to **Thomas Magee**, whose telephone number is **(703) 305 5396**. The Examiner can normally be reached on Monday through Friday from 8:30AM to 5:00PM (EST). If attempts to reach the Examiner by telephone are unsuccessful, the examiner's supervisor, **Tom Thomas**, can be reached on **(703) 308-2772**. The fax

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number for the organization where this application or proceeding is assigned is **(703)**

308-7722.

Thomas Magee
July 25, 2002

A handwritten signature in black ink that reads "Tom Thomas". The signature is written in a cursive style with a large, stylized "T" at the beginning.

TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800